US-PAT-NO: 5386119

DOCUMENT-IDENTIFIER: US 5386119 A

TITLE: Apparatus and method for thick wafer measurement

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The present invention applies to the measurement of thick, outer layers of semiconductors such as silicon in a semiconductor-on-insulator wafer such as silicon-on-insulator (SOI). Such an insulator may be silicon dioxide. The invention can also be used in measuring the thickness uniformity of silicon, germanium wafers and any other infrared transmitting material. A great deal of prior art exists in Fourier transform spectroscopy. However, imaging for transform infrared spectroscopy technology is not generally available and certainly no commercial measuring system exists to date. The present invention enables thickness maps of thick silicon layers to be produced in a timely manner, i.e., at less than one minute per map. Not only can less expensive starting wafers be used, but the map allows partial smoothing of the outer film as the bulk of the layer is removed by a high rate PACE polishing process. A

US-PAT-NO: 5337150

DOCUMENT-IDENTIFIER: US 5337150 A

TITLE: Apparatus and method for performing thin film layer thickness metrology using a correlation reflectometer

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Current commercial instruments can typically provide a thickness measurement of a thin film layer at a single point on the surface of the thin film layer. These instruments use a focused lens or a fiber bundle to locally illuminate the thin film layer surface with a beam of monochromatic light, and a grating or prism spectrograph to measure the surface spectral reflectance at each point. In all cases, this surface spectral reflectance data must be numerically corrected due to variations in the angle of incidence caused by the f-number of the illuminating beam. Also, the time required for these instruments to determine the thickness of an outer silicon layer of an SOI semiconductor wafer at a single point thereon is on the order of several minutes, which far exceeds the time desired for efficient wafer production.

DOCUMENT-IDENTIFIER: US 20020106821 A1

TITLE: Method of varying stepper exposure dose to compensate for across-wafer variations in photoresist thickness, and system for accomplishing same

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[0031] The layer of photoresist 25 in FIG. 2 is depicted at the point in the process after it has been subjected to a pre-bake (soft-bake) process and prior to being exposed to a light source in a stepper tool. At this point, one or more metrology tools 29 are used to measure or determine the thickness 26 of the layer of photoresist 25 at a plurality of locations across the surface of the structure 20. A variety of metrology tools may be used for this purpose. For example, the metrology tool 29 may be an ellipsometer, or any other tool useful for measuring the thickness 26 of the layer of photoresist 25.

DOCUMENT-IDENTIFIER: US 20020085212 A1

TITLE: Method and apparatus for controlling wafer thickness uniformity in a multi-zone vertical furnace

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[0010] In another aspect of the present invention, an apparatus is provided. The apparatus includes a multi-zone furnace adapted to bake a plurality of wafers for a first bake time, with each zone of the furnace accommodating at least one wafer. A metrology tool is further provided and is adapted to measure a film thickness of the at least one wafer baked in each zone of the furnace. A first controller is also provided and is adapted to determine a deposition rate for each zone of the furnace, the deposition rate being determined as a function of the film thickness of the wafer and the first bake time, and further adapted to assign the deposition rate of one of the zones as a baseline for the other zones of the furnace, and to adjust the deposition rate of the other zones of the furnace to be substantially the same as the baseline deposition rate. The furnace is further adapted to bake the subsequent set of wafers in the furnace with

DOCUMENT-IDENTIFIER: US 20020013120 A1

TITLE: Method and apparatus for optical monitoring in chemical mechanical polishing

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[0006] One way to determine the polishing endpoint is to remove the substrate from the polishing surface and examine it. For example, the substrate may be transferred to a metrology station where the thickness of a substrate layer is measured, e.g., with a profilometer or a resistivity measurement. If the desired specifications are not met, the substrate is reloaded into the CMP apparatus for further processing. This is a time consuming procedure that reduces the throughput of the CMP apparatus. Alternatively, the examination might reveal that an excessive amount of material has been removed, rendering the substrate unusable.

[0063] The transient signal graphs 300-320 can be viewed by the operator on the display 49 either during or after the polishing operation. The operator can use the displayed transient signal graphs for a variety of diagnostic and process control decisions (which may be